In a study of the phenological aspects of different species of plants, the fact that there is a definite season for blossoming is brought out. The length of day no doubt is an important influence here. It is probable that plants which blossom when the 12-hour day is reached would become perennials in the Tropics, where the day is never much less than 12 hours.

"Since it has been shown that the stature of some plants increases in proportion to the length of the day to which the plants are exposed under experimental conditions, this factor should be expected to have some influence upon the plants in their normal habitat. In general, exceptional stature would be attained in those regions in which a long-day period allowed the plants to attain their maximum vegetative expression before the shorter days intervened to initiate the reproductive period. This condition should hold true not only for different latitudes where a plant has an extensive northward and southward range, but for different sowings in the same locality at successively later dates during the season. It is a matter of common observation that the rankest-growing individuals among such weeds as the ragweed, pigweed, lamb's quarter, cocklebur, and beggar-ticks, other conditions being equal, are those which germinated earliest in the season, and consequently were afforded the longest favorable period of vegetative activity preceding the final flowering period. It is also a matter of common observation that all these weeds, when germinating very late in the summer and coming at once under the influence of the stimulus of the shortening days, blossom when very small, often at a height of only a few inches."

In studying plants introduced from other regions, in order to determine their economic qualities, the length of day factor must be carefully considered. Dr. H. L. Shantz, plant geographer of the United States Department of Agriculture, recently brought some grasses back from equatorial Africa which in the longer day period of northern Texas attained a height of more than 20 feet, with a corresponding increase in bulk of stalk.

### LENGTH OF DAY AS A FACTOR IN CROP YIELDS.

So far as is known, the length of day is the most potent factor in determining the relative proportions between the vegetative and the fruiting parts of many crop plants; and, in fact, fruiting may be completely suppressed by a length of day either too long or too short. In some crop plants the vegetative parts alone are sought, while in others the fruit or seed alone are wanted, and in still others maximum yields of both vegetative and reproductive parts are sought. It is apparent that the merits of the different varieties or strains may depend largely on the relative length of day in which they are grown, and, therefore, the date of planting may easily become the decisive factor. These are matters of vital importance to the plant breeder and the agronomist. Obviously, a delay of even two or three weeks in seeding certain crops because of inclement weather conditions or other considerations may bring about misleading results. It is to be remembered that planting too early may be equally inadvisable, for crops requiring relatively short days for blossoming may thus come under the influence of short days in early spring, resulting in "premature" flowering and a restricted amount of growth.

### CONCLUSION.

Seed reproduction can be attained by the plant only when it is exposed to a specifically favorable length of day (the requirements in this particular varying widely with the species and variety), and exposure to a length of day unfavorable to reproduction but favorable to growth tends to produce gigantism or indefinite continuation of vegetative development, while exposure to a length of day favorable alike to seed reproduction and to vegetative development, extends the period of seed reproduction and tends to induce the "ever-bearing" type of fruiting.

The term *photo-period* is suggested to designate the favorable length of day for each organism.

## TEMPERATURE OF AIR IN THE ICE CAVERN OF DOBSINA.[1]

By Dr. D. L. STEINER.

[Meteorological Institute, Budapest, Hungary, August 18, 1922.]

The Hungarian Meteorological Institute of Budapest has made, since November, 1911, several years' observations of the temperature in the ice cavern of Dobsina, latitude 20° 18′ 6″ E. (G. M. T.), longitude, 48° 52.2 N., elevation above m. s. l., about 980 m.

A thermograph was placed in an English instrument shelter. The automatic record from this has been regularly compared with a mercurial thermometer alongside of it. In 1912 a hygrograph was installed. Outside, in front of the cavern entrance, another instrument shelter containing a similar thermograph and a mercurial thermometer was erected. With the exception of a few interruptions due to instrumental defects, the data obtained extend to January, 1919. At the end of August, 1917, four thermometers were placed in the rocky wall of the cavern at the following depths: 0.24 m., 0.33 m., 0.44 m., and 1.08 m.

The cavern, the entrance of which faces north, forms a bag stretching downward, having the open end out and with a small aperture in the bottom. The latter leads into the crevices of the rocks. The air of the cavern has access to that outside only by means of the aperture just mentioned together with such small amounts as may pass through the capillary clefts in the rocks.

The chief results of these observations are shown in the table following:

*Monthly and annual mean temperatures in the cavern and departures from outside air temperatures. (Degrees C.)*

| | Jan. | Feb. | Mar. | Apr. | May. | June. |
|---|---|---|---|---|---|---|
| Mean cavern temperature | −3.16 | −2.74 | −1.80 | −0.90 | −0.36 | −0.10 |
| Difference between cavern and outside air temperatures | +3.62 | +0.54 | −2.43 | −3.88 | −7.60 | −10.44 |

| | July. | Aug. | Sept. | Oct. | Nov. | Dec. | Annual. |
|---|---|---|---|---|---|---|---|
| Mean cavern temperature | +0.07 | +0.15 | +0.21 | +0.09 | −0.73 | −1.39 | −0.89 |
| Difference between cavern and outside air temperatures | −10.65 | −11.06 | −6.78 | −3.39 | +0.11 | +0.53 | −4.37 |

[1] Abstract from a paper presented at the Hungarian Academy of Sciences, Budapest, Sept. 13, 1922. Meteorol. Zettschr., 1922, pp. 193–199.

For the temperature of the air in the cavern the following factors are, in general, of decisive importance: (1) When the temperature of the air outside is less than that of the cavern, the external colder and heavier air flows down into the cavern; (2) when the external air is being pushed into the cavern by the wind through the entrance and in much smaller measure through the narrow clefts in the rocks of the mountain; (3) the air which has come into the cavern, when above 0° C., melts the ice in the cavern, whereby it cools down and is only partly active in increasing the temperature of the cavern; (4) the rocky walls of the cavern, cooled to a considerable depth during winter, are acting against the warming of the cavern through the intruding external air during summer.

On the days when the external temperature is less than that of the air in the cavern, a well-pronounced and regular diurnal change of temperature could be observed, the range of which is 0.37° C., mean of the months October–April, and the range in the cavern is, in general, proportional to the range outside; on the days when the air outside is warmer than that in the cavern, this diurnal range is only 0.02° C. The rôle of the temperature differences between cavern and external air can not strictly be separated from the factor (3) of the temperature variation of the cavern, mentioned above, because a positive temperature difference between cavern and external air—the difference taken in the sense cavern-external air—is in general connected with a temperature of the intruding air below 0° C., and a negative difference with an external temperature above 0° C.

The hygrograph in summer invariably traces a straight line; the air in the cavern is saturated. At this time also the temperature of the cavern is almost invariable. The heat of the intruding air is chiefly employed in melting ice, and by the vapor of the ice water the air becomes saturated. In winter, on the contrary, the hygrograph sometimes registers considerable change of the relative humidity and in this respect the following regular features could be stated: When the temperature of the air in the cavern is less than that of the external air, the air in the cavern is saturated or very nearly so; when the temperature in the cavern is higher than outside, the relative humidity decreases and varies according to the amount of vapor contained in the ntruding air as long as the temperature of the air in the cavern has remained less than that of the air outside; at this moment the relative humidity begins to increase and by and by augments until the state of saturation is reached. From the days in the winter half year, on which the temperature in the cavern is higher than outside, the following diurnal change of the relative humidity could be determined:

| | A. M. | | | | | |
|---|---|---|---|---|---|---|
| Hour | 2 | 4 | 6 | 8 | 10 | 12 |
| Per cent | +0.23 | +0.25 | +0.27 | +0.24 | +0.20 | −0.08 |

| | P. M. | | | | | | Mean. | Range. |
|---|---|---|---|---|---|---|---|---|
| Hour | 2 | 4 | 6 | 8 | 10 | 12 | | |
| Per cent | −0.42 | −0.48 | −0.32 | −0.15 | +0.06 | +0.19 | 88.79 | 0.75 |

The conditions which determine the change of temperature in the cavern are also decisive for the change of the relative humidity.



## SEVERE HAILSTORM NEAR WEST CHESTER, PA.[1]

On August 31, 1922, there occurred near West Chester, Pa., a hailstorm of remarkable intensity.

It was reported to this office by Mr. J. T. Brosius, superintendent of the Philadelphia & West Chester Traction Co., from which we quote as follows:

"At 7:30 p. m., about three hours after the storm had ceased, I left the Fair Grounds for Philadelphia. When about 3 miles out I noticed that some fields were still almost entirely covered with hail, which was blown or washed into ridges several inches deep. On the south side of the road there was a bank about 70 feet long with a maximum depth estimated at 3 feet. I had it measured at 10:00 a. m. of the following day and found a maximum depth of 26 inches."

"On September 1, I was informed that there was a great amount of hail washed into the flat part of a field about a quarter of a mile south of West Chester road. I went there about noon, 20 hours after the storm, and found more than an acre of ground entirely covered with hail from a depth of a few inches to more than 2 feet by actual measurement. The average depth was about 1 foot."

[1] Communicated by Geo. H. Bliss, meteorologist, Philadelphia, Pa.